MAGNETO TESTING AND DESIGN

BY

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Magneto testing and design

MAGNETO TESTING
AND
DESIGN.

A THESIS

PRESENTED BY

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AND

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Thesis

--: Magneto Testing and Design :--

Our thesis, as the title implies, embodies a variety of tests made by means of a General Electric Oscillograph on an old and a new Pfanstiehl, type C3, make and break magneto; along with the design of a comparatively new type of magneto, which is fully described in the following paragraphs.

The first machine under test, as previously stated, was an old Pfanstiehl type C3, make and break magneto, having three bar magnets of the ordinary U shape. The armature consists of a core built to resemble an H about which the coil is wound lengthwise, the whole revolving in the magnetic field. We fastened a fly wheel 8" in diameter to one end of the armature shaft and to the other end we fastened a contact making device, being nothing more than a round ring 2" in dia. and about 1/4" wide, half of which was fibre and half brass, so that we had at the rim 180° of

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conductor material and 180° of insulating material. By means of a little copper brush which was allowed to rub on this make and break device we were enabled to collect the current from the magneto and also had a means of making or breaking the circuit at any position of the armature desirable. We drove the magneto from a 1/8 H.P. D.C. motor connected to the power mains, and by means of a regulating rheostat we were enabled to attain various speeds ranging from 50 to 450 R.P.M. For the first set of curves shown by figs. 1, 2, 3, and 4, we drove the magneto at a constant speed of 222 R.P.M. and by means of the small make and break device, previously described, we changed the position of the armature at the point of contact for each curve. By means of a variable shunt resistance connected directly to the magneto and from which a pair of leads ran to the vibrator coil of the oscillograph we were enabled to get the right sized deflection for photographing. The films used in photographing the curves were 3A Premo film pack, size 3 1/4" x 5 1/2". These films were placed, one each, in a drum which

rotated on a shaft, and had a split in the bottom through which, when opened, light was allowed to pass and thus expose the film. This drum was rotated at a speed of 75 R.P.M., being approximately 1/3 the speed of the magneto. The drum was driven directly from a small D.C. motor taking 110^V from the power mains, and by means of a regulating rheostat connected in the armature circuit we were enabled to get a wide range of speeds. In this manner the four current curves shown by figs. 1, 2, 3, and 4 were photographed, and the positions of the armature at the point of contact for each curve are shown in log sheet No.1. The current was carefully calibrated by sending a known current through and measuring the deflection. This was done by connecting the shunt resistance, previously mentioned, to the power mains, having a load rheostat in the circuit, and a D.C. ammeter-Then we sent through the oscillograph a definite amount of current and on a piece of cross-section paper we carefully measured the deflection of this current. Then we were able to calculate the amount of current for all other deflections. In fig. 1

the position of the armature at the point of contact was 130° from the zero position. The curve shows us a rather abrupt rise in current to about .22 amp., and then a comparatively slow drop to about .10 amperes where the circuit is broken and the current immediately drops to zero. In Fig.2 we have a quick rise of current to approximately .17 amperes, then a long drop, the current reversing in direction to about .10 amperes before the break comes. The position of the armature at the point of contact for this curve is the zero position. This position is shown in log sheet No.1- Fig. 3, in which the position of the armature at the point of contact was 90° from the zero position, shows approximately the same rise in current as fig.1, and the same drop except that the break comes at about .13 amp. instead of .10 amperes. In fig.4 we find that the current is still reversed at the point of contact and it travels in this direction for a short distance, then rises quickly to about .22 amp., and breaks at about .21 amperes, making a rather peaked wave. The position of the armature at the point of con-

tact, for this curve, was 40° from the zero position.

Following this we took a set of readings, shown in log sheet No.2; for the various positions of the armature at the point of contact, mentioned in the previous paragraph. From this data we plotted the curves, shown in figs. 23, 24, 25 and 26, which show us the relation of the maximum current to the speed of the magneto in R.P.M. Curves 23, 24, and 25 are identical, which shows that for a wide range of positions of the armature at the point of contact, we get the same rise in current value, with the same increase in speed. Curve 26 shows a considerable decrease in current over the other curves, the position of the arm at the point of contact being the zero position.

The next set of curves, figs. 5, 6, 7 and 8, were photographed in the same manner as figs. 1, 2, 3 and 4 except that the armature in this case was short circuited and the make and break device was not used. The curves were taken for 4 different speeds ranging from 70 R.P.M. to 406 R.P.M. The data for this set of curves are shown in log

sheet No. 3. Upon investigation we find that an increase in current and the curves also tends to approach more nearly a sine curve with each increase in speed. The current calibration is the same as in figs. 1, 2, 3, and 4, as we used the same shunt with the sliding contact in exactly the same position.

The New Type C3 Pfanstiehl Magneto.

The second magneto which was tested was of the three bar type, with a rotating armature of the "H" shape. This magneto differs from the one previously tested in that it is constructed to develop a greater current at a lower voltage. It is the new type C3 Pfanstiehl Magneto, manufactured by the Pfanstiehl Electrical Co., North Chicago, Ill. The construction is similar to the old type magneto previously described.

The end of the shaft protruding from the instrument had a heavy pulley about eight inches in diameter fastened on to it. This pulley acted also as a flywheel to produce a constant rotation of the armature. The magneto was driven at vari-

ous speeds by a small D.C. motor belted to the pulley on the armature shaft. A rheostat in the armature circuit of the motor allowed the speed to be varied to any desired value. On the other end of the armature shaft was placed the contact making device, by which the circuit was broken or made at any desired position of the armature. When oscillograms were desired with the armature short-circuited, this device was not used. In obtaining all the current curves or oscillograms, a shunt was used to vary the current passing through the vibrator of the oscillograph. By changing the resistance of this shunt by means of a sliding contact, the deflection of the spot of light from the vibrator of the oscillograph could be varied.

The oscillograph is a machine or instrument for obtaining photographs of electric waves. An arc light is placed outside the box containing the instrument, which box is light-proof. This arc light is allowed to shine upon one, two or three little mirrors fastened to vibrators which are connected in any circuits desired. These vi-

brators oscillate according to the current passing through them, and so move the spots of light which they throw upon the rotating film. The film is fastened upon the outside of a drum of about four-inch diameter, and everything is enclosed in a light-proof case. There is a shutter in the latter to allow the film to be exposed. The oscillating spot of light thrown upon a rotating film produces a wave of the same shape as the electric wave operating the vibrator, if the speed of the drum is correctly obtained. A shutter in the box of the instrument is opened, and allows the beam of light to enter. An electrical contact is made when one revolution of the film is complete, closing the shutter. In taking photographs of the current waves with the armature short-circuited, as in figs. 9, 10, 11 and 12, the middle vibrator was used in connection with the current furnished by the magneto. This operated the spot of light which gave the waves shown in these figures. After the film was exposed, the magneto was stopped, and the film was rotated again, with the spot of light stationary at the zero position.

This gave the zero line shown in these curves. As these curves do not show the position of the armature at any time, they would be useless for comparison. But a special timing device was made use of. As the contact making device was not used in taking the short-circuit waves, it was used as a timing device to show the position of the armature at any desired point on the wave. Also it allows the waves to be divided up into degrees.

To operate this arrangement, a couple of dry cells were connected in series with a second vibrator and all attached to the make and break device. This was set so as to close this auxiliary circuit when the armature was in its zero position. This position is shown clearly on log sheet No. 1. By means of this arrangement the different curves of this group can be compared, and all can be plotted together on one sheet as a composite diagram. See pages 42 and 43.

Figures 9, 10, 11, and 12 show curves of the current with the armature short-circuited. The timing device was used to show the relative positions of the armature with respect to the peaks. These four curves were all taken in the same manner, the only difference being in the speeds. These

range from 70 R.P.M. to 406 R.P.M. As the speed increases, the peak grows higher, showing an increase in current developed. But this is not proportional to the speed. At a speed of 70 R.P.M. the current maximum is about .9 of an ampere, while at a speed of 406 R.P.M., an increase of about six times, the current only increases to 1.25 amperes, an increase of about one and a half times. Also the wave shape changes with the change in speed. As the speed increases, the wave changes from a long, low peaked one, to a shorter one with a flatter top. The relative speed of magneto and drum remained the same, at approximately three to one. See log sheet No.4 for this data. The timing device shows that as the speed increased the maximum value of current was reached a little sooner than at the lower speeds. Also that at the higher speeds the zero position of the armature, as shown on log sheet No. 1, corresponded more nearly with the zero position of the waves, than at the lower speeds.

Figures 13, 14, 15 and 16 show curves of the current from this magneto, using the make and

break device. The speeds of the drum and magneto were kept constant at 138 R.P.M. and 406 R.P.M. respectively. Only the position of the closing of the circuit was changed. This varied through 180 degrees, starting with 0 degrees, 40 degrees from zero position, 90 degrees from zero position, and 140 degrees from the zero position. As the speed was kept constant, the current generated by the magneto was constant, so the waves in these four figures are all of the same shape.

However, the maximums are not all equal. This is due to closing the circuit at different points on the curve. These curves would all have the same shape if they were continued. The straight line drop on the right side of each wave is due to the current falling to zero at that point because the circuit was opened up then.

Therefore these curves are useful only to show when the best time to make and break the circuit is. In other words, to help in timing the magneto. In figure 15 the wave makes a complete half cycle and returns to zero before the

circuit is opened. As the spark is obtained when the circuit is opened, and as it depends upon the current at the time of break, it is readily seen that there would be a very small spark at the time of break. In figure 16, where the position of armature at point of contact is 40 degrees from its zero position, the break occurs at the maximum value of the current, or at the peak of the wave. This position of break should give the hottest and most effective spark. In figures 13 and 14, the maximum reached in each case is the same as in figure 16, but in the former cases the break comes after the maximum value of current has been reached. Therefore these two settings of the contact-making device are not as satisfactory as the one in figure 16. In figure 16, the result of making circuit early is noticed. The current starts out negatively, then reverses and rises to a high maximum, when the circuit is broken, giving the spark.

To obtain the E.M.F. curves of this magneto the circuit had to be changed somewhat. The shunt was discarded, and a high, non-inductive re-

sistance, carbon filament lamps were used in this case, was introduced in the circuit. The contact making device was used in a separate circuit with another vibrator to indicate the position of the armature with reference to the peak of the waves. The main circuit now went from the magneto terminals through the resistance to the middle vibrator of the oscillograph, and back to the magneto. This arrangement gave an almost true E.M.F. wave. The slight distortion was due to the inductance in the armature. The arrangement was kept the same for these four curves, the only changes being in the speeds of the drum and magneto. The former was run at approximately one-third the speed of the magneto for all curves. The make and break device shows the value of the voltage when the armature was in its zero position, as shown on log sheet No.1. Wherever the break occurs in the two parallel lines at the top of the film, there the armature has just passed through its zero position, and the contact was closed. As there are two such positions of the armature every revolution, there are two such breaks on the curve sheet

for a complete cycle of the wave. The same arrangement was utilized in taking the current curves with the armature short-circuited.

With an increase in speed of the magneto the maximum value of the voltage increased. The wave became more peaked, and not so spread out on its base. In other words, it shortened up and increased in height. In all the four curves the zero of the wave seems to be the same angular distance behind the zero position of the armature. If it were not for the inductance in the armature the zero would come at the zero position of the armature, because at this point the coil is not cutting any lines of force of the magnets.

At a speed of 72 R.P.M. the voltage is 6.5. At a speed of 411 R.P.M. the voltage is 37.5. For an increase of nearly six times in the speed, the voltage increased nearly six times, showing that the voltage is approximately proportional to the speed of the magneto.

Studying the previous statement closely it can be seen that for high speed gas engines the foregoing magneto can be successfully used, because at a speed of only 411 R.P.M. a fairly

high voltage and current are obtained. And at the high speeds at which the engine will run, the magneto will work correspondingly better. But upon entering the field of the slow speed stationary engine, difficulty is encountered at once. First, in order to start the engine, the magneto would not be sufficient, as its velocity would not be great enough to develop a sufficiently large voltage and current. Then, at the highest rate of speed of the engine from 200 to 250 R.P.M. the magneto would not be working efficiently enough. Its most efficient speed would never be reached.

So resource is had to a magneto capable of developing its maximum voltage and current at all times, independent of the speed of the engine or magneto. Such a magneto is the third one under test, a two-bar oscillating magneto of the planetary type, actuated by a cam shaft driven at half the engine speed working against a spring. This spring is to move the inductor through the second part of its travel. It is strong enough to always keep the end of the inductor up against the cam. The spring is used to furnish a means of

obtaining the maximum voltage and current at all times. No matter at what speed the cam shaft is rotating, when the spring trips the inductor at the break in the cam, the lines of force of the magneto are always cut at the same speed, therefore developing the maximum voltage and current. So, when starting the engine, no matter how slowly it is cranked, the same spark will be produced as at the higher speeds. Therefore, no batteries will have to be used in starting the engine.

Full details of this magneto can be seen by referring to the blue print accompanying this. No tests were run on the Pfanstiehl type of oscillating magneto, but the percentage of total flux that was utilized was determined.

This was found to be only 55 %. That is, only 55% of the total number of lines of force of the magneto was cut by the coil surrounding the conductor. This percentage was increased somewhat by filing off the sharp edges of the inductor. This increased the useful flux to 60% of the total flux.

Deciding that this was not efficient e-

nough, and also that the magneto was too bulky, and that the design could be improved somewhat, with the aid of Professor E. H. Freeman, Head of the Electrical Department at Armour Institute, a new magneto was designed, being smaller, but embodying the same principles as the former magneto.Several improvements were introduced, tending to increase its efficiency, by lessening the leakage flux. Also, several changes were made to improve the mechanical operation of the magneto.

This design was sent to the Pfanstiehl Electrical Laboratories, North Chicago, Ill., to be made up. Upon its receipt at Armour Institute, tests were made to determine the percentage of the total flux the useful flux was.

To obtain the useful flux nine turns of fine wire were wound around the inductor in the same manner as the coil would be placed, Using a fluxmeter, the useful flux was found to be 26,950 maxwells, see log sheet No. 7. To obtain the total flux nine turns of the same wire were wound around the outside edge of the inductor, in the same plane as the inductor. Using the fluxmeter

the arrangement gave the total flux to be 43,340 maxwells, for the two bar magneto. The ratio of the useful to the total flux gave a percentage of 62.3%.

This increase in efficiency, coupled with the improved mechanical features, makes the new design more of a success than the Pfanstiehl type. A coil of No. 23 double cotton covered wire was wound upon a bobbin especially made for this magneto. After being soaked in paraffin, and allowed to dry, it was taken off the bobbin, taped, and put in position in the magneto. A cam was now cut out of a round piece of brass, and so designed as to allow the inductor to travel the proper distance for one complete reversal of the flux through the coil. This distance is 9/16 of an inch. This cam was mounted on a shaft; and driven by the small motor by a double set of belts through a reduction pulley. Thus a slow speed could be obtained at which to operate the cam, together with a large torque. The magneto was placed against the cam so that the inductor was moved by means of the upper rod through it. A small hole was bored through the end of the

lower rod, and a spiral spring was attached to it. The other end of the spring was fastened to a stationary rod bolted to the table. The magneto was now clamped in this position. No matter at what speed the cam was driven, the spring would pull the inductor back at the same speed every time. So the deflection of the spot of light in the oscillograph was always the same for the same setting of the shunt resistance.

The apparatus was connected up to take the current curves as previously described. Two curves were taken, shown in figures 21 and 22. Figure 21 shows a current curve taken with the armature short-circuited. Figure 22 shows the same curve with the addition of the marking device. This was arranged by making the end of the inductor rod close a circuit when it had reached the end of its travel after having been tripped. This circuit was connected to another vibrator on the oscillograph, and moved another spot of light on the film. A couple of dry cells furnished the necessary current. The break in the top line of figure 22 shows just

how much after the inductor was tripped that it reached the end of its travel. It also shows that the current reached a maximum and started to decrease before the inductor had reached the end of its travel after being tripped. Therefore, some device could be attached to the inductor itself to constitute a make and break device. The best time to break a circuit like this in order to get the hottest spark is when the current is at its maximum value. As the inductor is still moving when the peak of the wave is reached, this device could easily be actuated by one of the inductor rods.

The short-circuit curve as given in figures 21 and 22 show several interesting things. First, the current rises almost instantaneously to the maximum value after the inductor has been tripped. Then, before the inductor has finished its travel, the current starts to drop off again. From Figure 22, it can be seen that the current reaches its maximum value when the inductor has completed only 55.6% of its travel. This shows that in the first part of its travel the inductor reverses most of the lines of force through

the coil. The curve of the cam was perfectly smooth and symmetrical. Therefore the peak in the wave when the cam was moving the inductor is not due to the shape of the cam, but to an increased flux density in that part of the field. The maximum value in the opposite direction was .325 of an ampere. The same number of lines of force were cut by the inductor while travelling in each direction, therefore the area under each curve is the same. But as the speed of the inductor was greater in one direction than inthe other, one peak of the wave is greater than the other.

In conclusion, it can be said that, from the tests which we made and have previously described, the new type "C3" Pfanstiehl magneto shows a decided improvement over the old type "C3" for stationary gas engines. In regard to the oscillatory type of magneto, our results show that it is highly practical, and that with a few improvements it can be made a very efficient machine.

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Log Sheet No. 1

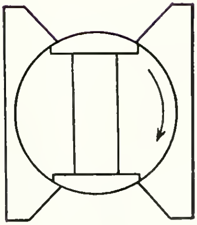
Old Type C3 Pfanstiehl Magneto

Date taken: May 2,'13 Place: Dynamo Lab. A.I.T.

Oscillograph tests on Pfanstiehl, old type C3, make and break magneto.

Current curves for various positions of the armature at the point of contact, speed of magneto remaining constant.

Speed of Magneto	Speed of Drum	Position of Armature	Film No.
222 R.P.M.	75 R.P.M.	90° from 0°	1
222 R.P.M.	75 R.P.M.	40° " 0°	2
222 R.P.M.	75 R.P.M.	130° " 0°	3
222 R.P.M.	75 R.P.M.	Zero position	4



Zero position of

Arm.at pt.of cont.

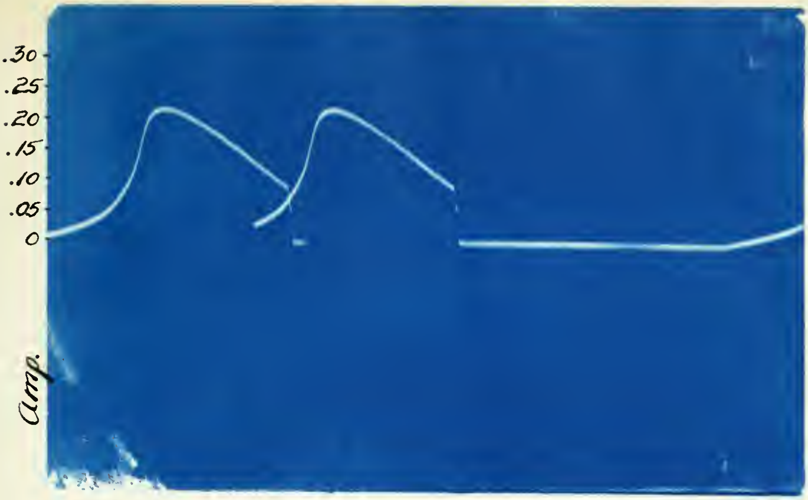


Fig. 1.

Current Curve. Speed of Mag. 222 R.P.M.

Position of Armature at point of contact 130° from 0°.

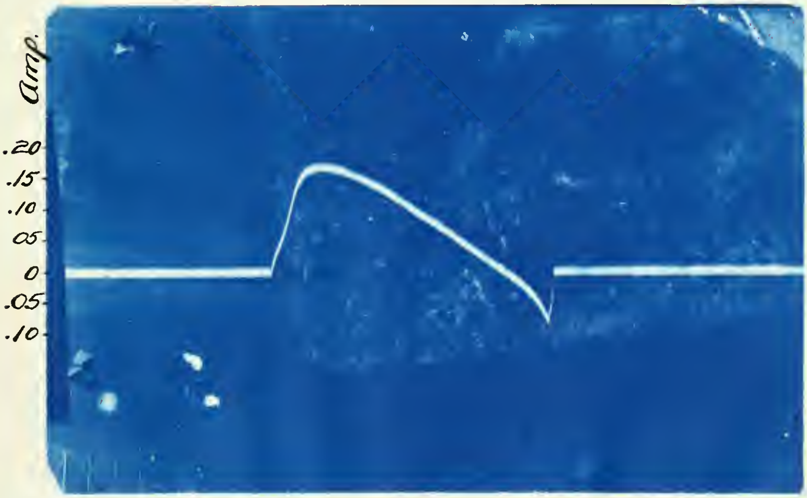


Fig. 2.

Current Curve. Speed of Mag. 222 R.P.M.

Position of Armature at point of contact 0°.

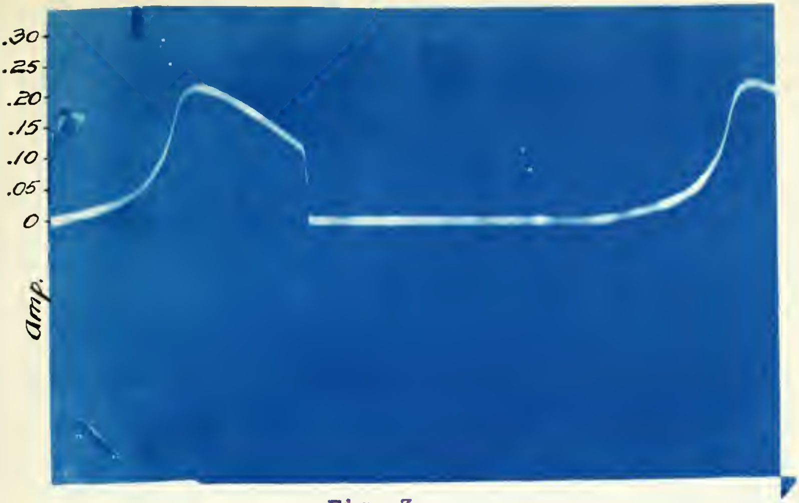


Fig. 3.

Current Curve. Speed of Mag. 222 R.P.M.

Position of Armature at point of contact 90° from 0°.

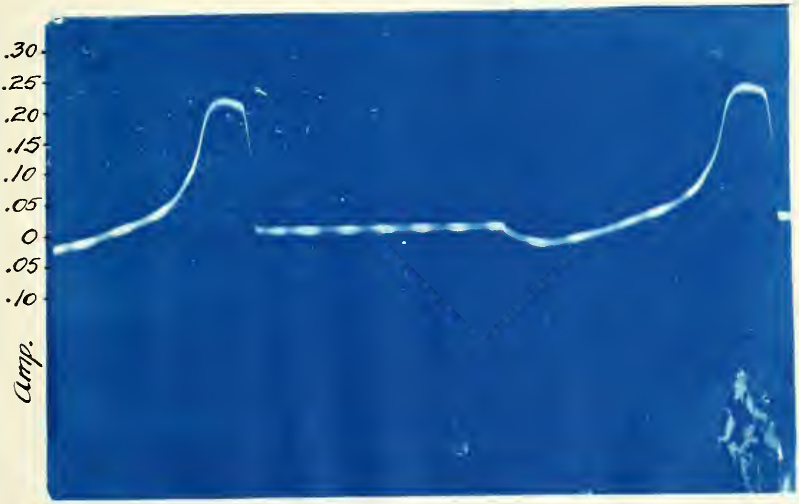


Fig. 4.

Current Curve. Speed of Mag. 222 R.P.M.

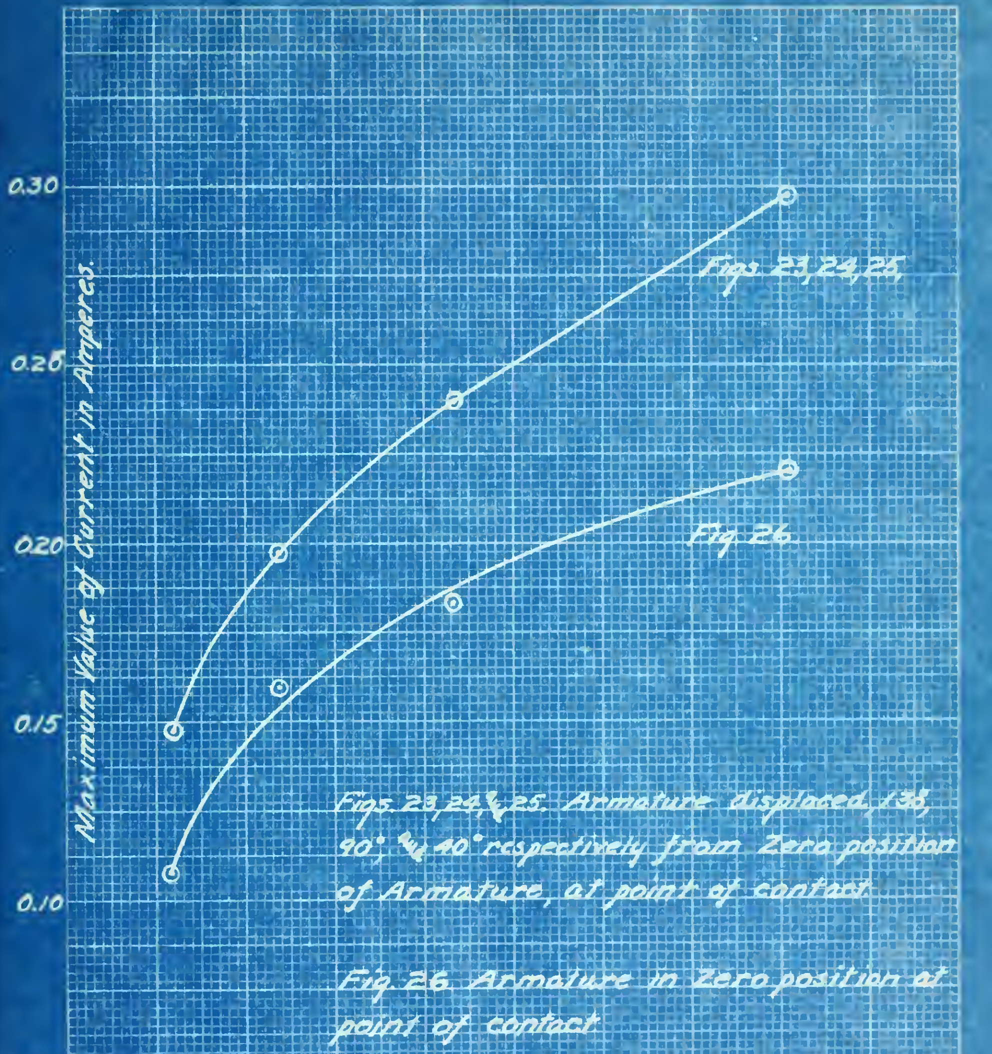
Position of Armature at point of contact 40° from 0°.

Log Sheet No.2

Old Type C3, Pfanstiehl Magneto

Date taken: May 9,1913 Place: Dynamo Lab.A.I.T.

Speed of Magneto	Position of Armature	Current Deflection
404 R.P.M.	130° from 0°	1.2 inches
404 "	90° " 0	1.2 "
404 "	40° " 0	1.2 "
404 "	Zero pos.	0.9 "
216 "	130° from 0	1.0 "
216 "	90° " 0	1.0 "
216 "	40° " 0	1.0 "
216 "	Zero pos.	0.75 "
119 "	130° from 0	0.80 "
119 "	90° " 0	0.80 "
119 "	40° " 0	0.80 "
119 "	Zero pos.	0.65 "
60 "	130° from 0	0.60 "
60 "	90° " 0	0.60 "
60 "	40° " 0	0.60 "
60 "	Zero pos.	0.45 "


Maximum Value of Current in Amperes.
0.30
0.25
0.20
0.15
0.10
0.05
0
100
200
300
400
500
Speed of Magneto in R.P.M.
Figs. 23,24,25.
Fig. 26.
Figs. 23,24,&25. Armature displaced 135°, 90° & 40° respectively from Zero position of Armature, at point of contact.
Fig. 26. Armature in Zero position at point of contact.

Log Sheet No. 3

Old Type C3 Pfanstiehl Magneto

Date taken: May 12, 1913 Place: Dynamo Lab. A.I.T.

Current curves for various speeds when armature is short-circuited.

Speed of Magneto	Speed of Drum	Film No.
410 R.P.M.	120 R.P.M.	1
224 "	80 "	2
122 "	48 "	3
58 "	35 "	4

Calibration of current

1.05" deflection = 0.26 amperes.

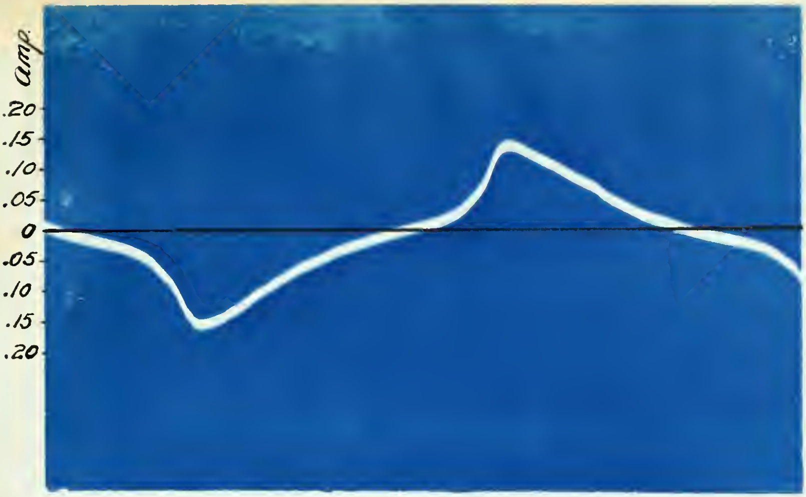


Fig. 5.
Current Curve when Armature is short-circuited.

Speed of Magneto 122R.P.M.

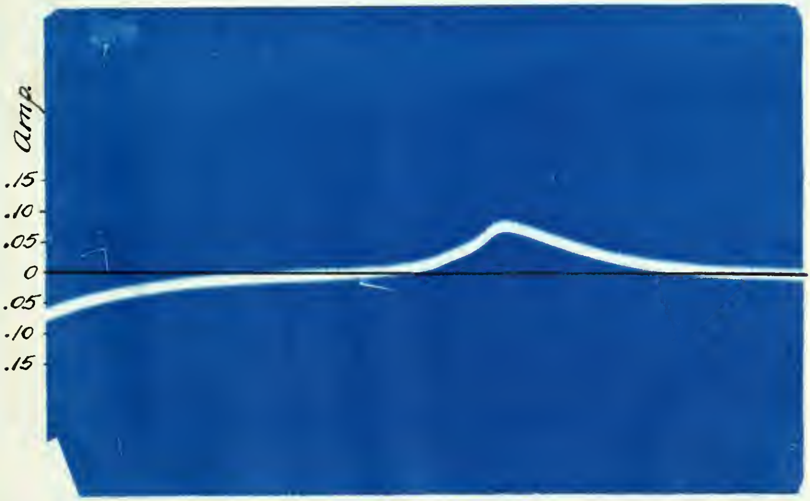


Fig. 6.
Current Curve when Armature is short-circuited.

Speed of magneto 58 R.P.M.

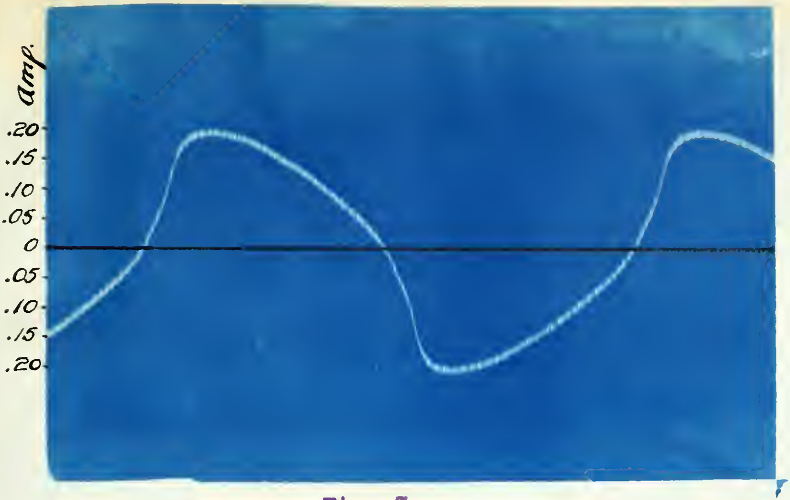


Fig. 7.
Current Curve when Armature is short-circuited.

Speed of Magneto 410 R.P.M.

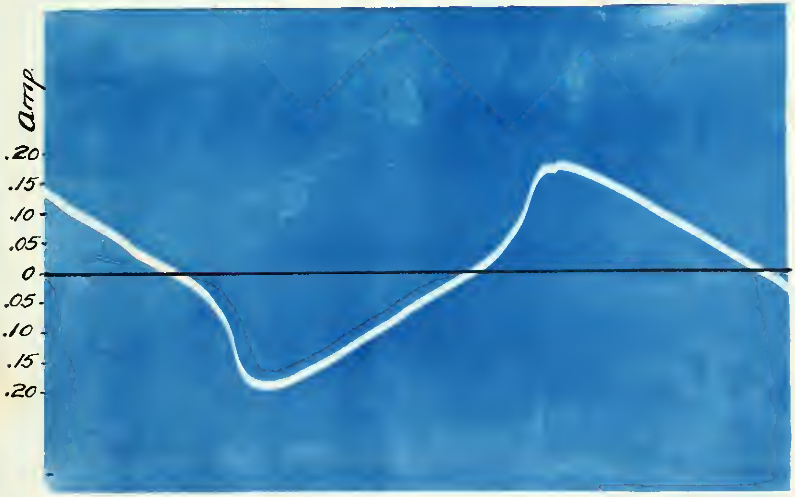


Fig. 8.
Current Curve when Armature is short-circuited.

Speed of Magneto 224 R.P.M.

Log Sheet No. 4

New Type C3, Pfanstiehl Magneto

Date taken: May 14, '13 Place: Dynamo Lab. A.I.T.

Current curves for various speeds when armature is short-circuited.

Speed of Magneto	Speed of Drum	Film No.
219 R.P.M.	75 R.P.M.	1
106 "	40 "	2
70 "	38 "	3
406 "	136 "	4

For D.C. curve, contact made at zero position of the armature.

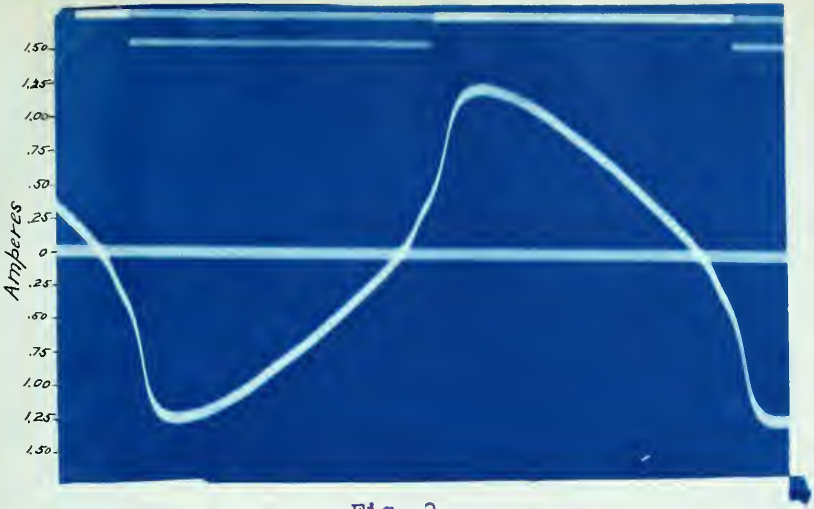


Fig. 9.
Current Curve when Armature is short-circuited.

Speed of Magneto 219 R.P.M. With Timing Device.

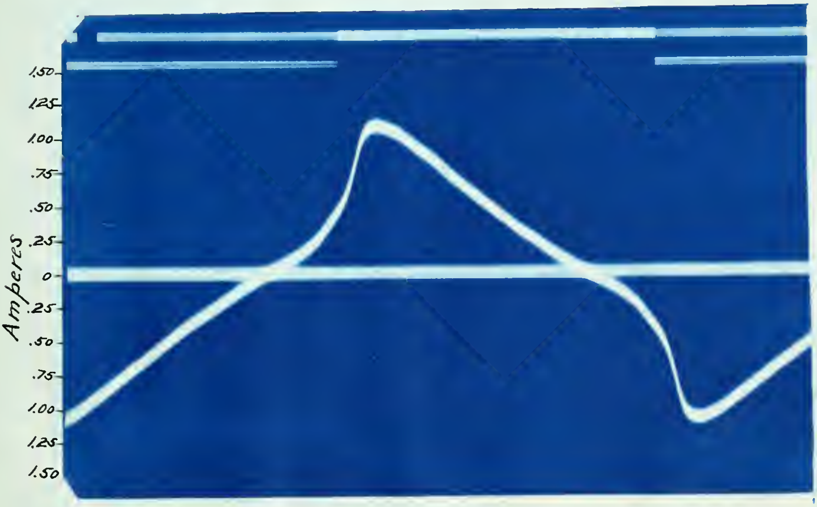


Fig. 10.
Current Curve when Armature is short-circuited.

Speed of Magneto 106 R.P.M. With Timing Device.

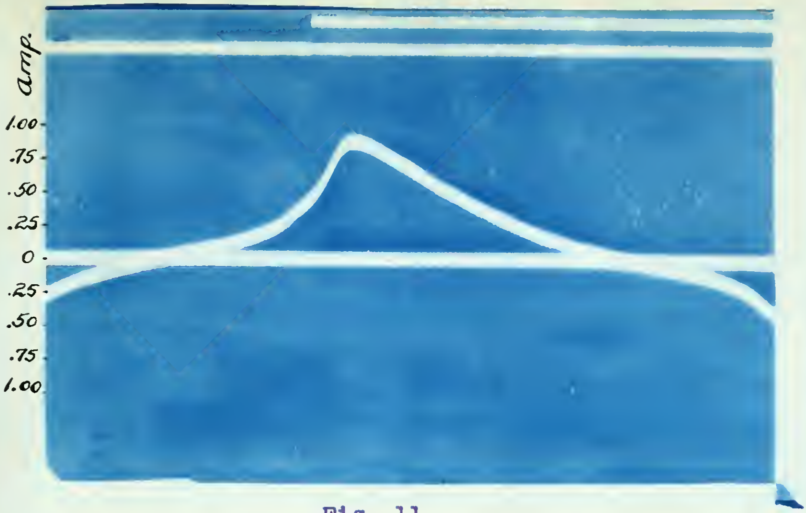


Fig. 11.
Current Curve when Armature is short-circuited.

Speed of Magneto 70 R.P.M. With Timing Device.

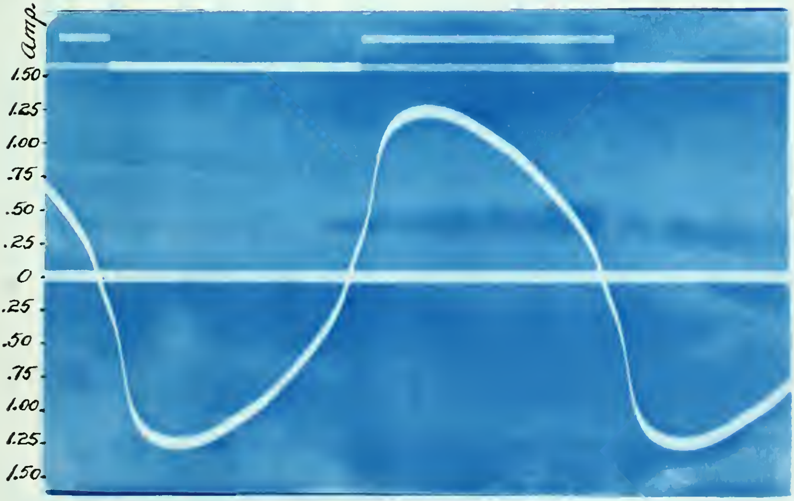


Fig. 12.
Current Curve when Armature is short-circuited.

Speed of Magneto 406 R.P.M. With Timing Device.

Log Sheet No.5

New Type C3 Pfanstiehl Magneto

Date taken: May 14, '13 Place: Dynamo Lab.A.I.T.

Current curves for various positions of the armature at the point of contact, speed of magneto remaining constant.

Speed of Magneto	Speed of Drum	Position of Armature	Film No.
406 R.P.M.	138 R.P.M.	Zero Position	1
406 "	" "	40° from 0°	2
406 "	" "	90° " 0°	3
406 "	" "	140° " 0°	4

Calibration of current-

1.505 amp. = 1.35" deflection.

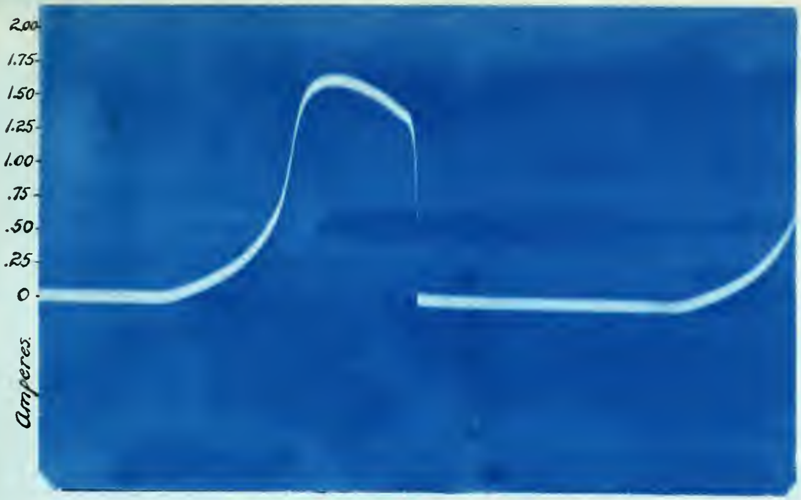


Fig. 13.

Current Curve. Speed of Mag. 406 R.P.M.

Position of Armature at point of contact 90° from 0°.

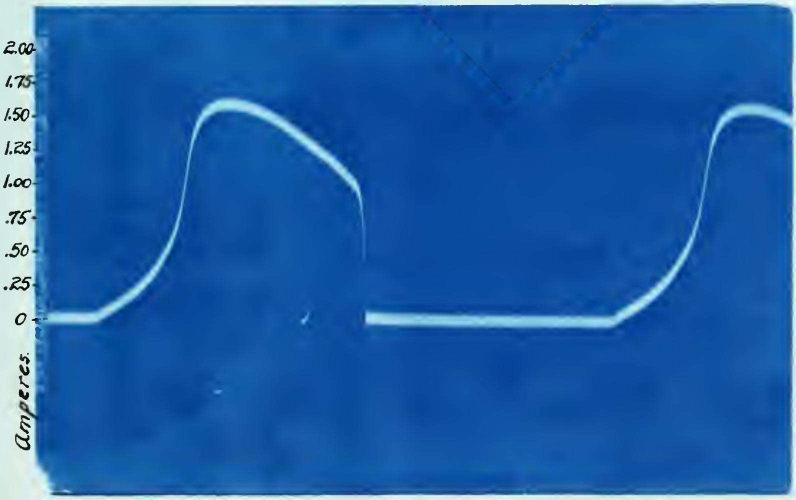


Fig. 14.

Current Curve. Speed of Mag. 406 R.P.M.

Position of Armature at point of contact 140° from 0°.

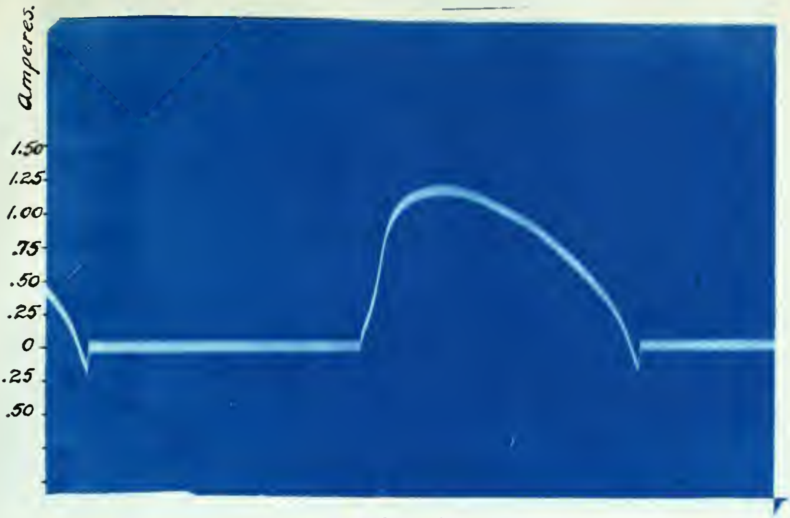


Fig. 15.

Current Curve. Speed of Mag. 406 R.P.M.

Position of Armature at point of contact 0°.

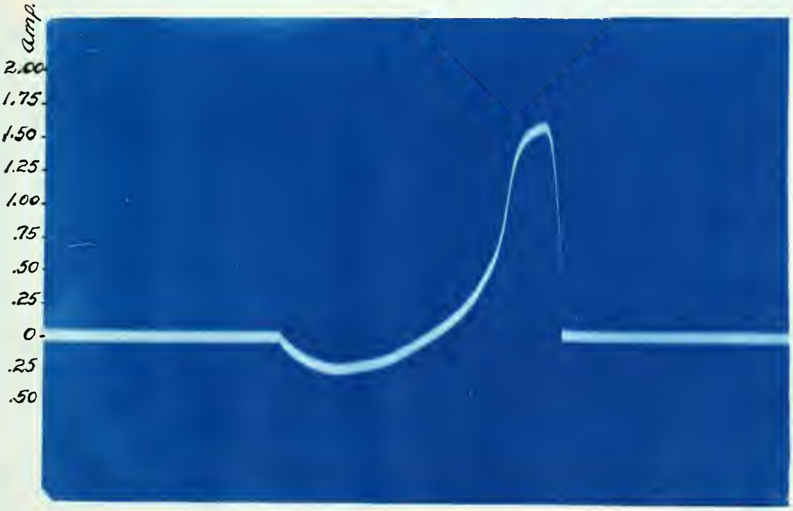


Fig. 16.

Current Curve. Speed of Mag. 406 R.P.M.

Position of Armature at point of contact 40° from 0°.

Log Sheet No. 6

New Type C3 Pfanstiehl Magneto

Date taken: May 14, '13 Place: Dynamo Lab. A.I.T.

E.M.F. curves for various speeds.

Non-inductive resistance in circuit.

Speed of Magneto	Speed of Drum	Film No.
411 R.P.M.	135 R.P.M.	1
227 "	75 "	2
112 "	42 "	3
72 "	36 "	4

Calibration of Voltage

30.5 volts = 1.25" deflection

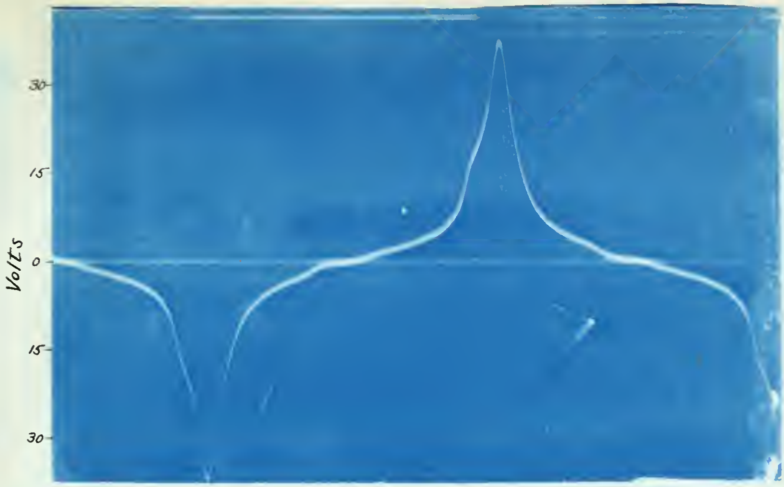


Fig. 17.

E.M.F. Curve. Speed of Mag. 411 R.P.M.

Non-ind. Res. in circuit. With Timing Device.

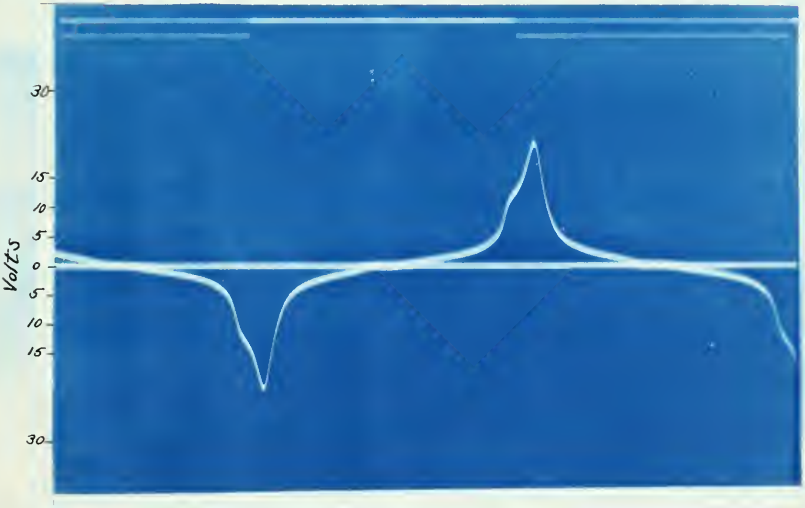


Fig. 18.

E.M.F. Curve. Speed of Mag. 227 R.P.M.

Non-ind. Res. in circuit. With Timing Device.

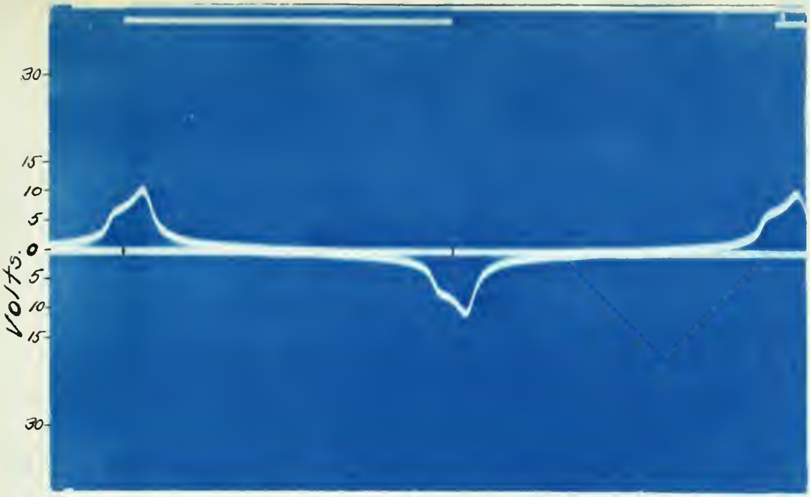


Fig. 19.

E.M.F. Curve. Speed of Mag. 112 R.P.M.

Non-ind.Res.in circuit. With Timing Device.

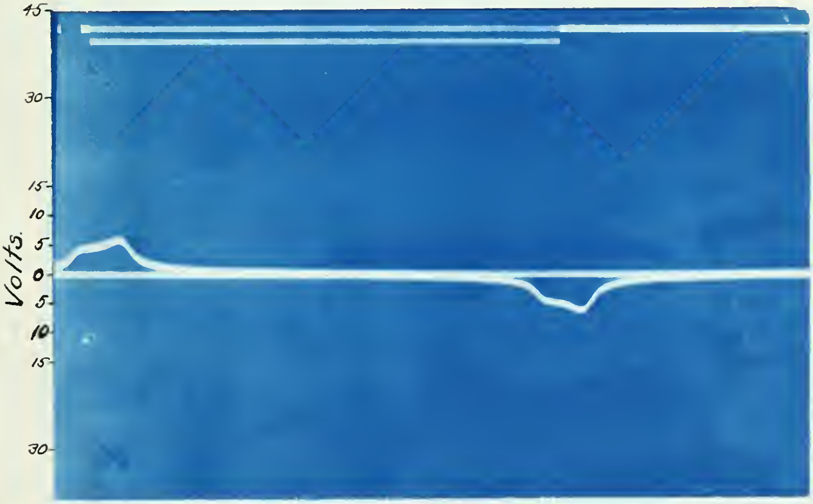


Fig. 20.

E.M.F. Curve. Speed of Mag. 72 R.P.M.

Non-ind.Res.in circuit. With Timing Device.

Log Sheet No. 7

Oscillating Magneto

Date taken: May 16,1913 Place: Dynamo Lab. A.I.T.

Useful Flux

No. of turns of wire used = 9

deflections

30 to 18 = 4800 Maxwells for 99 turns
25 to 24 = 4900 " " " "
27 to 22 = 4900 " " " "
29 to 20 = 4900 " " " "
33 to 15 = 4800 " " " "
37 to 12 = 4900 " " " "
41 to 8 = 4900 " " " "
Average 4900 " " " "

4900 x 11 = 53900

$\frac{53900}{2}$ = 26,950 Maxwells = Useful flux

-Total Flux-

No. of turns of wire used = 9.

deflections:

0 to 41 = 4100 Maxwells for 99 turns
0 to 40 = 4000 " " " "
10 to 29 = 3900 " " " "
15 to 22 = 3700 " " " "
25 to 15 = 4000 " " " "
Average 3940 " " " "
3940 x 11 = 43,340 " " " "

Useful flux is $\frac{26950}{43340} \times 100 = 62.3$ % of total flux

Log Sheet No. 8

Oscillating Magneto

Date taken: May 16, '13 Place: Dynamo Lab.A.I.T.

No. of Oscillations	Speed of Drum	Film No.
120	44 R.P.M.	1
120	44 "	2
120	44 "	3

Curve No. 3 shows position of break

Calibration of Current.

0.515 amperes = 1" deflection.

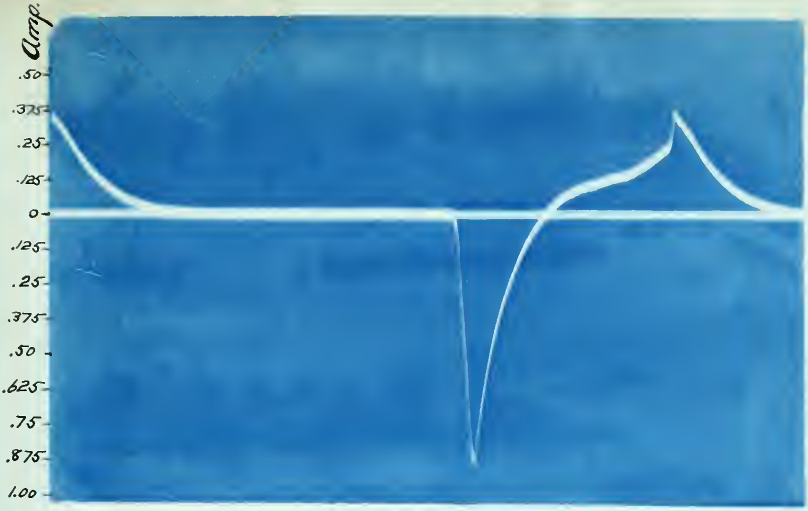


Fig. 21.
Current Curve of Oscillating Mag.

Armature short-circuited. Speed of Mag. 120 Oscillations.

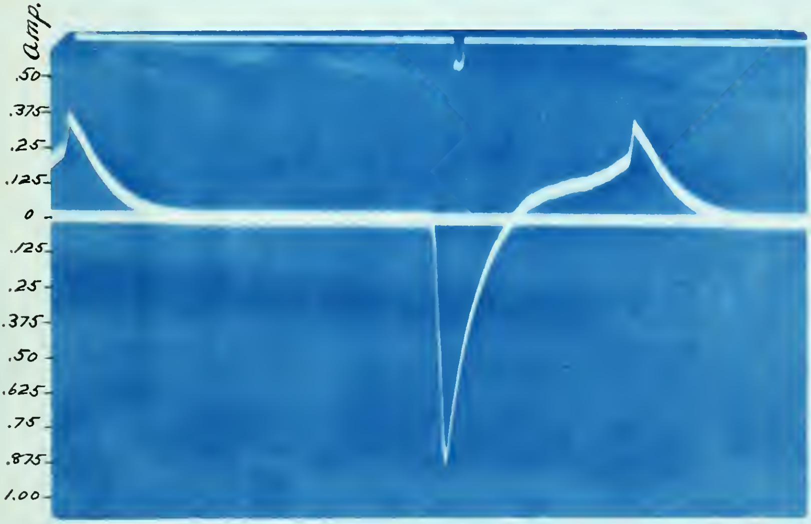
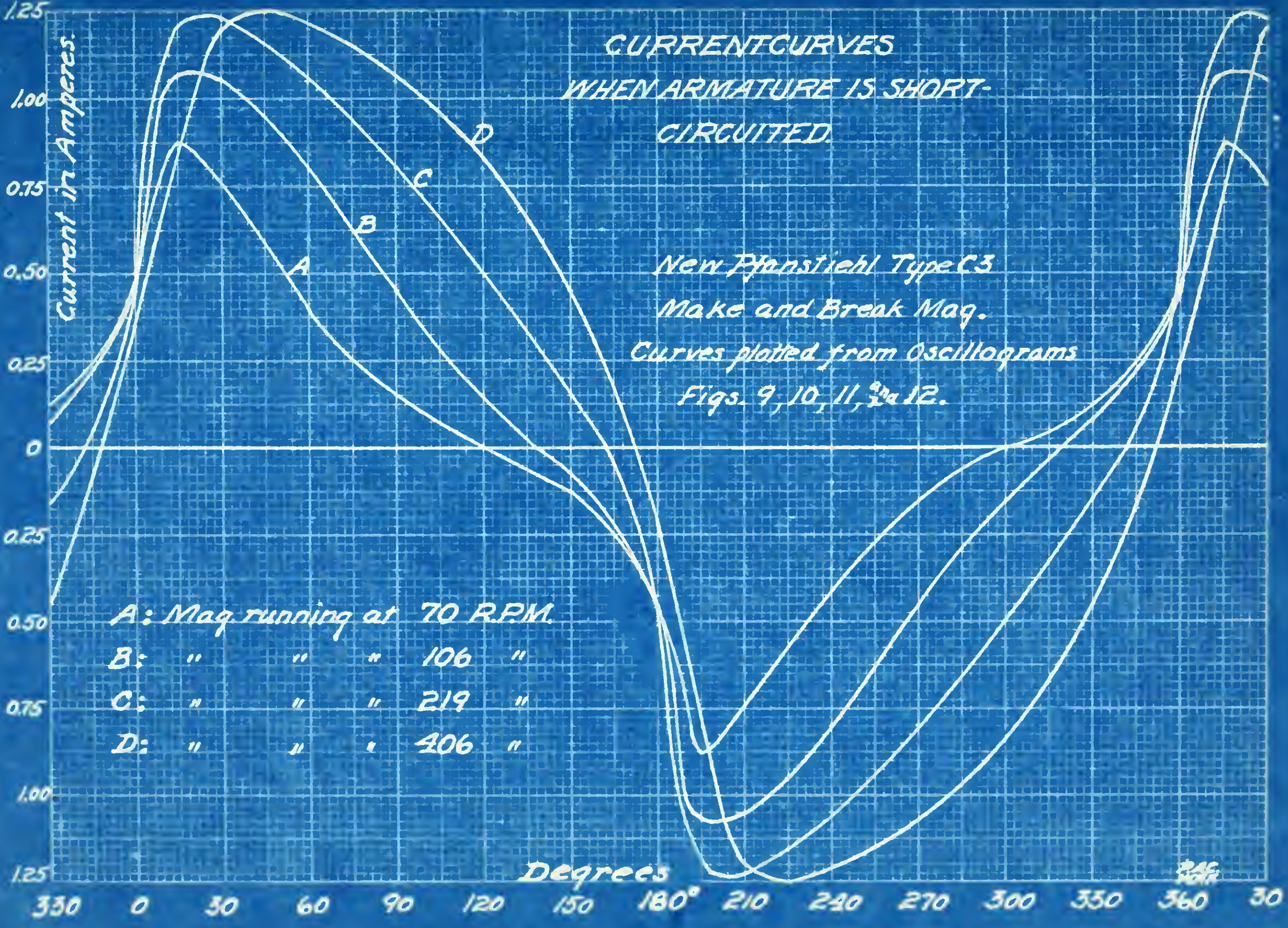
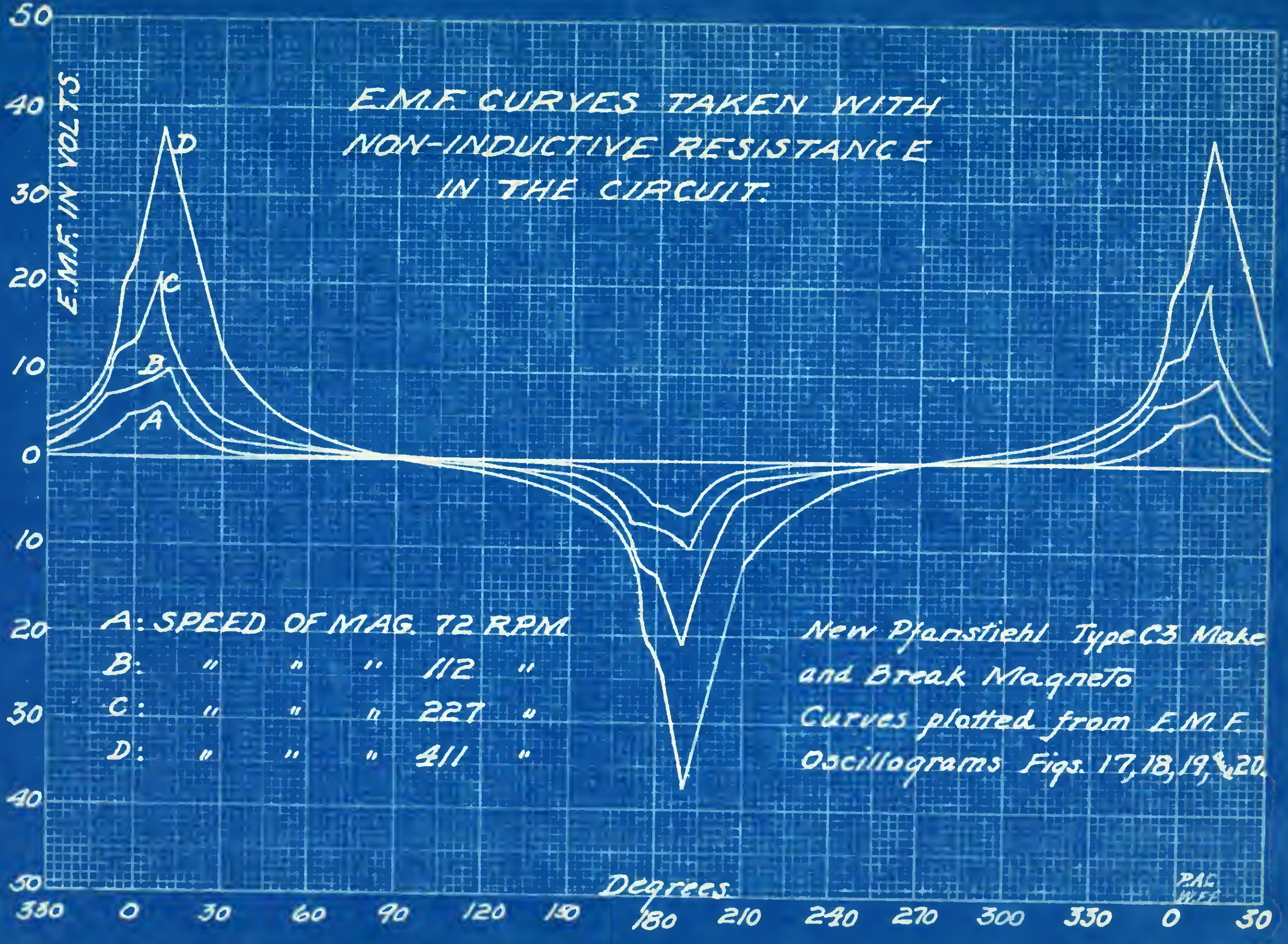
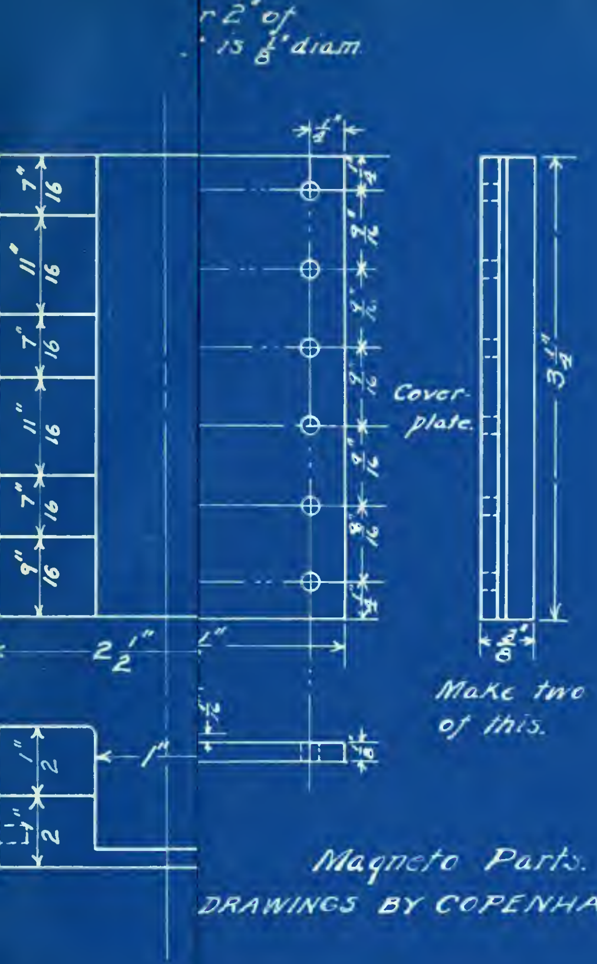


Fig.22.
Current Curve of Oscillating Mag. Showing pos. of Ind.

Armature short-circuited. Speed of Mag. 120 Oscillations.

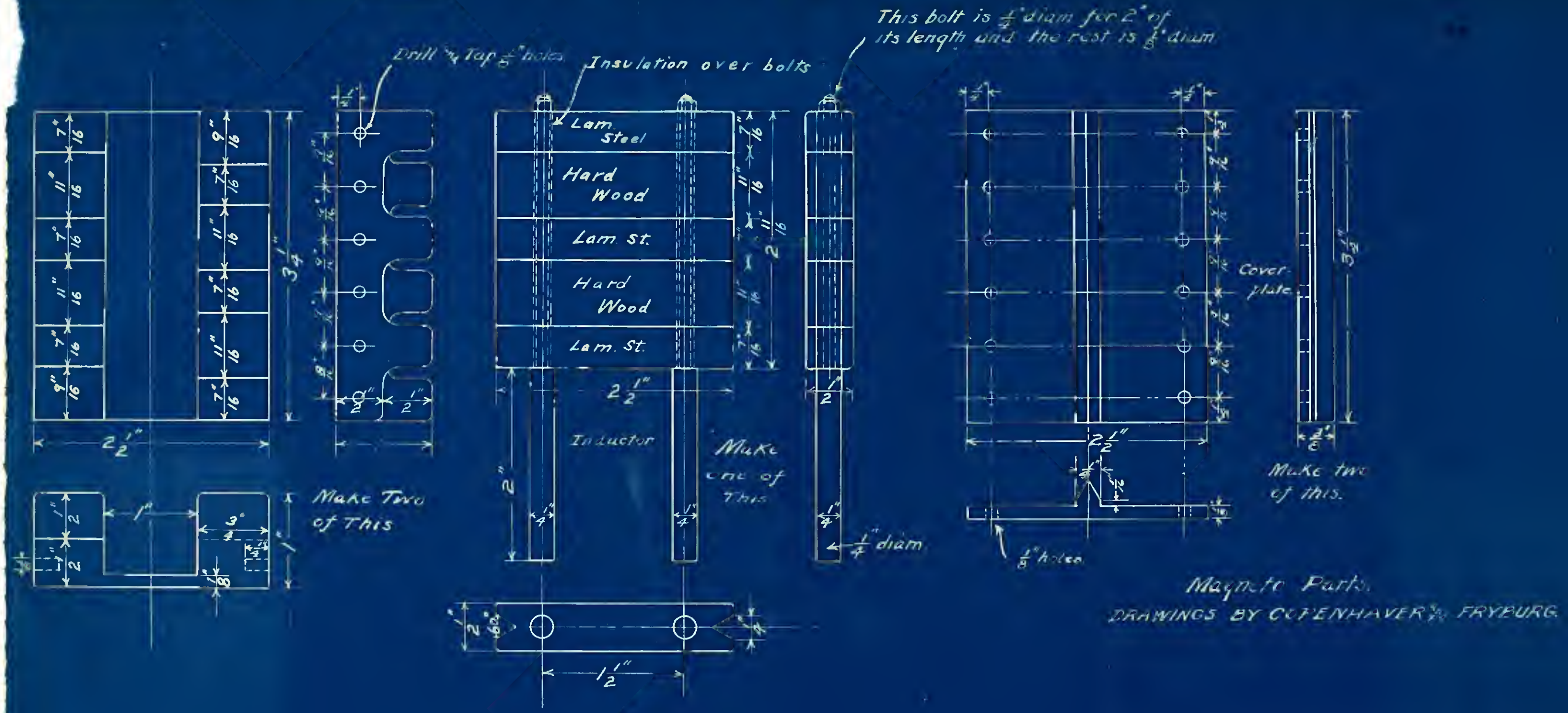

CURRENT CURVES
WHEN ARMATURE IS SHORT-
CIRCUITED.
New Pfanstiehl Type C3
Make and Break Mag.
Curves plotted from Oscillograms
Figs. 9, 10, 11, and 12.
A: Mag running at 70 R.P.M.
B: " " " 106 "
C: " " " 219 "
D: " " " 406 "
A
B
C
D
Current in Amperes.
1.25
1.00
0.75
0.50
0.25
0
0.25
0.50
0.75
1.00
1.25
Degrees
330
0
30
60
90
120
150
180°
210
240
270
300
330
360
30


E.M.F. CURVES TAKEN WITH
NON-INDUCTIVE RESISTANCE
IN THE CIRCUIT.
E.M.F. IN VOLTS
50
40
30
20
10
0
10
20
30
40
50
D
C
B
A
A: SPEED OF MAG. 72 R.P.M.
B: " " " 112 "
C: " " " 227 "
D: " " " 411 "
New Pfanstiehl Type C3 Make
and Break Magneto
Curves plotted from E.M.F.
Oscillograms Figs. 17, 18, 19 & 20.
Degrees
330
0
30
60
90
120
150
180
210
240
270
300
330
0
30
P.A.C.
W.F.F.



Magneto Parts.

DRAWINGS BY COPENHAVER & FRYBURG.



Magneto Parts.
DRAWINGS BY COPENHAVER & FRYBURG